## AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions of claims in the application.

1. – 7. (Cancelled).

8. (Currently Amended): [[The]] A communication control system ~~according to claim 6,~~ for controlling communications performed between a plurality of communication stations that are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

a high-priority communication section configured to perform a high-priority communication normally via the main path;

a low-priority communication section configured to perform a low-priority communication via the sub-path;

a path diagnosing section configured to diagnose a soundness of the main path and the sub-path; and

a switching section configured to switch the communication path of the high-priority communication to the sub-path when the main path is diagnosed as faulty as a result of diagnosis by the path diagnosing section,

wherein the path diagnosing section includes:

a path state storing section configured to store path state information of a path state from a home station to each communication station; and

a fixed-cycle path diagnosing section configured to diagnose the communication path from the home station to each communication station in a fixed cycle,

wherein the fixed-cycle path diagnosing section is configured to register the path state information obtained from the diagnosis result, in the path state storing section,

wherein the fixed-cycle path diagnosing section is configured to broadcast a path diagnosis packet in accordance with a multicast protocol of Internet Protocol,

wherein different IP multicast addresses are assigned to the main path and the sub-path respectively,

wherein each communication station is configured to perform broadcasting by using the IP multicast address corresponding to a path selected between the main path and the sub-path, as a destination IP address, and is configured to receive a path diagnosis packet of which destination IP address matches with the IP multicast address corresponding to each of the main path and the sub-path,

wherein the fixed-cycle path diagnosing section includes a diagnosis packet transmitting section ~~for broadcasting~~ configured to broadcast to other communication stations a path diagnosis packet including receive state information of path diagnosis packets from other communication stations, and

wherein on receiving [[a]] the path diagnosis packet, the fixed-cycle path diagnosing section [[registers]] is configured to register in the path state storing section receive state information of the path diagnosis packet transmitted by the home station, the receive state information being included in the received path diagnosis packet, as the path state information of

the communication path from the home station to a transmitting source of the path diagnosis packet.

9. – 12. (Cancelled).

13. (Currently Amended): [[The]] A communication control system ~~according to claim 6 or 8, further comprising:~~ for controlling communications performed between a plurality of communication stations that are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

a high-priority communication section configured to perform a high-priority communication normally via the main path;

a low-priority communication section configured to perform a low-priority communication via the sub-path;

a path diagnosing section configured to diagnose a soundness of the main path and the sub-path;

a switching section configured to switch the communication path of the high-priority communication to the sub-path when the main path is diagnosed as faulty as a result of diagnosis by the path diagnosing section; and

a multiplexed communication station where units each including the high-priority communication section, the low-priority communication section, the path diagnosing section and the switching section are provided while being multiplexed, any one of the units serves as an

active unit and the other unit serves as a standby unit, and a different address is assigned to the high-priority communication section of each unit,

wherein the path diagnosing section includes:

a path state storing section configured to store path state information of a path state from a home station to each communication station; and

a fixed-cycle path diagnosing section configured to diagnose the communication path from the home station to each communication station in a fixed cycle,

wherein the fixed-cycle path diagnosing section is configured to register the path state information obtained from the diagnosis result, in the path state storing section,

wherein the fixed-cycle path diagnosing section is configured to broadcast a path diagnosis packet in accordance with a multicast protocol of Internet Protocol,

wherein different IP multicast addresses are assigned to the main path and the sub-path respectively,

wherein each communication station is configured to perform broadcasting by using the IP multicast address corresponding to a path selected between the main path and the sub-path, as a destination IP address, and is configured to receive a path diagnosis packet of which destination IP address matches with the IP multicast address corresponding to each of the main path and the sub-path, and

wherein another communication station ~~which performs~~ is configured to perform a transmission to the multiplexed communication station performs communication by designating the active unit, and when failing to communicate with the active unit via any one of the

multiplexed communication paths, [[retries]] is configured to retry to communicate by switching a designation to the standby unit.

14. (Currently Amended): The communication control system according to claim 13, wherein the multiplexed communication station each includes a self diagnosing section,

the self diagnosing section in the active unit [[halts]] configured to halt a communication operation while placing the home unit in a standby state on detecting a failure,

the standby unit [[places]] configured to place the home unit in the active state so as to start a communication operation when the other unit halts the communication operation, and [[broadcasts]] configured to broadcast to the other communication stations that the home unit has become the active unit, and

each communication station includes a table storing information indicating which unit of the multiplexed communication station is active, [[performs]] is configured to perform transmission to the active unit while referencing the information stored in the table, and [[updates]] is configured to update the information in the table when receiving the broadcast communication.

15. (Currently Amended): [[The]] A communication control system ~~according to claim 6,~~ for controlling communications performed between a plurality of communication stations that are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

a high-priority communication section configured to perform a high-priority communication normally via the main path;

a low-priority communication section configured to perform a low-priority communication via the sub-path;

a path diagnosing section configured to diagnose a soundness of the main path and the sub-path; and

a switching section configured to switch the communication path of the high-priority communication to the sub-path when the main path is diagnosed as faulty as a result of diagnosis by the path diagnosing section,

wherein the path diagnosing section includes:

a path state storing section configured to store path state information of a path state from a home station to each communication station; and

a fixed-cycle path diagnosing section configured to diagnose the communication path from the home station to each communication station in a fixed cycle,

wherein the fixed-cycle path diagnosing section is configured to register the path state information obtained from the diagnosis result, in the path state storing section,

wherein the fixed-cycle path diagnosing section is configured to broadcast a path diagnosis packet in accordance with a multicast protocol of Internet Protocol,

wherein different IP multicast addresses are assigned to the main path and the sub-path respectively,

wherein each communication station is configured to perform broadcasting by using the IP multicast address corresponding to a path selected between the main path and the sub-path, as a destination IP address, and is configured to receive a path diagnosis packet of which destination IP address matches with the IP multicast address corresponding to each of the main path and the sub-path, and

wherein while the path diagnosing section detects a failure in the main path, the path diagnosing section [[broadcasts]] is configured to broadcast the failure in the main path to all communication stations in a fixed cycle.

16. (Currently Amended): The communication control system according to claim 15, wherein when the low-priority communication section [[receives]] is configured to receive a broadcast notice indicating that the main path is faulty, the low-priority communication section [[controls]] is configured to control a transmission so that a transmission count per unit time of low-priority communication is equal to or smaller than a predetermined value,

and when the broadcast notice is not received for equal to or more than a predetermined time, the low-priority communication section [[determines]] is configured to determine that the main path is restored to normal operation and [[halts]] is configured to halt the transmission control of making the transmission count be equal to or smaller than the predetermined value.

17. (Currently Amended): [[The]] A communication control system ~~according to claim 4,~~ for controlling communications performed between a plurality of communication stations that

are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

first communication function implementing sections which are multiplexed so as to correspond with the main path and the sub-path respectively, and each of which is configured to implement a communication function in a physical layer of an OSI hierarchical model;

second communication function implementing sections which are multiplexed so as to correspond with the multiplexed first communication function implementing sections respectively, and each of which is configured to implement a communication function in a data link layer of the OSI hierarchical model;

a high-priority communication section configured to perform a high-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to any one of the multiplexed communication paths;

a low-priority communication section configured to perform a low-priority communication via the first communication function implementing section and the second communication function implanting section each corresponding to the sub-path; and

a multicast address storing section configured to store a plurality of MAC multicast addresses,

wherein the high-priority communication section and the low-priority communication section coexist in a single communication station,

wherein the second communication function implementing section includes:

an address storing section configured to store MAC addresses corresponding to the high-priority communication section and the low-priority communication section respectively;

a transmitting section configured to attach the corresponding MAC address to a communication frame depending on whether a transmission requestor is the high-priority communication section or the low-priority communication section, and configured to transmit the communication frame to the communication path; and

a receiving section configured to compare a destination MAC address of a communication frame received from the first communication function implementing section with the MAC address stored in the address storing section, and when a match is found in the in the comparison result, configured to send the received communication frame to the corresponding communication section,

wherein when a destination MAC address of a communication frame received from the communication path matches with any one of the addresses stored in the MAC multicast address storing section, the second communication function implementing section is configured to send the communication frame to the high-priority communication section, otherwise the second communication function implementing section is configured to send the communication frame to the low-priority communication section, and

wherein while the low-priority communication section recognizes the main path as faulty, the low-priority communication section [[controls]] is configured to control a transmission so that a transmission count per unit time of the low-priority communication is equal to or smaller than a predetermined value.

18. (Currently Amended): [[The]] A communication control system ~~according to claim 6,~~ for controlling communications performed between a plurality of communication stations that are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

a high-priority communication section configured to perform a high-priority communication normally via the main path;

a low-priority communication section configured to perform a low-priority communication via the sub-path;

a path diagnosing section configured to diagnose a soundness of the main path and the sub-path; and

a switching section configured to switch the communication path of the high-priority communication to the sub-path when the main path is diagnosed as faulty as a result of diagnosis by the path diagnosing section,

wherein the path diagnosing section includes:

a path state storing section configured to store path state information of a path state from a home station to each communication station; and

a fixed-cycle path diagnosing section configured to diagnose the communication path from the home station to each communication station in a fixed cycle,

wherein the fixed-cycle path diagnosing section is configured to register the path state information obtained from the diagnosis result, in the path state storing section,

wherein the fixed-cycle path diagnosing section is configured to broadcast a path diagnosis packet in accordance with a multicast protocol of Internet Protocol,

wherein different IP multicast addresses are assigned to the main path and the sub-path respectively,

wherein each communication station is configured to perform broadcasting by using the IP multicast address corresponding to a path selected between the main path and the sub-path, as a destination IP address, and is configured to receive a path diagnosis packet of which destination IP address matches with the IP multicast address corresponding to each of the main path and the sub-path, and

wherein in a case where the low-priority communication section is recognizing the main path as faulty, while the sub-path is not under transmission, the low-priority communication section is configured to immediately [[performs]] perform the high-priority communication, and while the sub-path is not under transmission and there is no high-priority communication waiting to be transmitted, the low-priority communication section [[performs]] is configured to perform the low-priority communication.

19. (Cancelled).

20. (Currently Amended): [[The]] A communication control system ~~according to claim 19,~~ for controlling communications performed between a plurality of communication stations that are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

a high-priority communication section configured to perform a high-priority communication normally via the main path;

a low-priority communication section configured to perform a low-priority communication via the sub-path;

a path diagnosing section configured to diagnose a soundness of the main path and the sub-path;

a switching section configured to switch the communication path of the high-priority communication to the sub-path when the main path is diagnosed as faulty as a result of diagnosis by the path diagnosing section; and

an authentication section configured to perform authentication between the high-priority communication sections in different communication stations so as to enable communication between authenticated communication stations,

wherein the path diagnosing section includes:

a path state storing section configured to store path state information of a path state from a home station to each communication station; and

a fixed-cycle path diagnosing section configured to diagnose the communication path from the home station to each communication station in a fixed cycle,

wherein the fixed-cycle path diagnosing section is configured to register the path state information obtained from the diagnosis result, in the path state storing section,

wherein the fixed-cycle path diagnosing section is configured to broadcast a path diagnosis packet in accordance with a multicast protocol of Internet Protocol,

wherein different IP multicast addresses are assigned to the main path and the sub-path respectively,

wherein each communication station is configured to perform broadcasting by using the IP multicast address corresponding to a path selected between the main path and the sub-path, as a destination IP address, and is configured to receive a path diagnosis packet of which destination IP address matches with the IP multicast address corresponding to each of the main path and the sub-path, and

wherein the authentication section includes:

a public key generating section ~~for generating~~ configured to generate an electronic public key to be exchanged between the home station and another communication stations from an electronic private key that is unique to the home station;

a key transmitting section ~~for broadcasting~~ configured to broadcast the generated public key to all communication stations;

a common key generating section ~~which generates~~ configured to generate an electronic common key that is unique to the home station and another communication station from a public key received from the another station and the private key of the home station, [[generates]] configured to generate the electronic common key for each communication station, and [[stores]] configured to store the generated common key;

an authentication packet transmitting section ~~which performs~~ configured to perform at least either encryption of a packet or attachment of an authentication value to a packet by using

the generated common key, and [[transmits]] configured to transmit at least either the encrypted packet or the packet to which the authentication value is attached; and

an authentication packet receiving section ~~which performs~~ configured to perform at least either decrypting of the received packet by using the common key or determination on whether reception is allowed based on the common key and the authentication value being attached to the packet.

21. (Currently Amended): The communication control system according to claim 13, wherein the common key generating section [[generates]] is configured to generate the common key from the private key and the public key by using Differ-Hellman method.

22. (Currently Amended): The communication control system according to claim 20, wherein the authentication section includes:

a key update section ~~for updating~~ configured to update the common key by changing the private key per predetermined time;

a confirming section ~~which stores~~ configured to store the common key just before update and a latest common key, [[confirms]] configured to confirm the authentication value by using the latest common key on receiving the packet, and in a case where the confirmation is determined as illegal, [[confirms]] configured to confirm the authentication value by using the common key just before update; and

a decoding section ~~for performing~~ configured to perform decoding of the packet by using either the common key just before update or the latest common key by which the authentication value is confirmed as valid.

23. (Cancelled).

24. (Currently Amended): [[The]] A communication control system ~~according to claim 23,~~ for controlling communications performed between a plurality of communication stations that are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

first communication function implementing sections which are multiplexed so as to correspond with the main path and the sub-path respectively, and each of which is configured to implement a communication function in a physical layer of an OSI hierarchical model;

second communication function implementing sections which are multiplexed so as to correspond with the multiplexed first communication function implementing sections respectively, and each of which is configured to implement a communication function in a data link layer of the OSI hierarchical model;

a high-priority communication section configured to perform a high-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to any one of the multiplexed communication paths; and

a low-priority communication section configured to perform a low-priority communication via the first communication function implementing section and the second communication function implanting section each corresponding to the sub-path,

wherein the high-priority communication section and the low-priority communication section coexist in a single communication station,

wherein the second communication function implementing section includes:

an address storing section configured to store MAC addresses corresponding to the high-priority communication section and the low-priority communication section respectively;

a transmitting section configured to attach the corresponding MAC address to a communication frame depending on whether a transmission requestor is the high-priority communication section or the low-priority communication section, and configured to transmit the communication frame to the communication path; and

a receiving section configured to compare a destination MAC address of a communication frame received from the first communication function implementing section with the MAC address stored in the address storing section, and when a match is found in the in the comparison result, configured to send the received communication frame to the corresponding communication section,

wherein a router configured to perform a path control of the communication path in accordance with Internet Protocol is provided on the communication path, and the communication path includes a plurality of sub-networks being interconnected by the router, and

wherein a sole master station exists on the sub-network,

the master station transmits an inter-network diagnosing frame including path state information on the paths between the home station and all another communication stations existing on the sub-network to which the home station belongs and path state information on the path between the home station and a master station existing on a sub-network to which the home station does not belong, and

each of all communication stations on the plurality of sub-networks including the master station and the other communication stations includes:

a path state storing section ~~for storing~~ configured to store path state information indicating whether the communication path from the home station to each of another communication stations is sound;

a diagnosing message receiving section ~~which registers~~ configured to register in the path state storing section the path state between the home station and the communication station existing on the sub-network to which the home station does not belong, based on the path state information included in the inter-network diagnosing frame; and

a data transmitting section ~~which selects~~ configured to select either the main path or the sub-path in accordance with the information in the path state storing section, and performs transmission of data.

25. (Currently Amended): The communication control system according to claim 24 or 34, further comprising:

a selecting section ~~which generates~~ configured to generate a list of network addresses of all communication stations existing on the sub-network, and in a case where an address of the

home station is the address that is uniquely determined among the list based on a predetermined condition, [[causes]] configured to cause the home station to operate as the master station on the sub-network.

26. (Currently Amended): The communication control system according to ~~claim 1 or 6~~ claims 8, 13, 15, 17, 18, 20, 24 or 34, wherein the high-priority communication section [[performs]] is configured to perform communication in accordance with a protocol dedicated to process control, and

the low-priority communication section [[performs]] is configured to perform communication in accordance with an open standard protocol.

27. (Currently Amended): The communication control system according to ~~claim 1 or 6~~ claims 8, 13, 15, 17, 18, 20, 24 or 34, wherein the high-priority communication section [[transfers]] is configured to transfer at least one of process data, an operation amount and an alarm, and

the low-priority communication section [[performs]] is configured to perform at least one of image data transfer, file transfer and message transfer.

28. – 33. (Cancelled).

34. (New): A communication control system for controlling communications performed between a plurality of communication stations that are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

a high-priority communication section configured to perform a high-priority communication normally via the main path;

a low-priority communication section configured to perform a low-priority communication via the sub-path;

a path diagnosing section configured to diagnose a soundness of the main path and the sub-path; and

a switching section configured to switch the communication path of the high-priority communication to the sub-path when the main path is diagnosed as faulty as a result of diagnosis by the path diagnosing section,

wherein the path diagnosing section includes:

a path state storing section configured to store path state information of a path state from a home station to each communication station; and

a fixed-cycle path diagnosing section configured to diagnose the communication path from the home station to each communication station in a fixed cycle,

wherein the fixed-cycle path diagnosing section is configured to register the path state information obtained from the diagnosis result, in the path state storing section,

wherein the fixed-cycle path diagnosing section is configured to broadcast a path diagnosis packet in accordance with a multicast protocol of Internet Protocol,

wherein different IP multicast addresses are assigned to the main path and the sub-path respectively,

wherein each communication station is configured to perform broadcasting by using the IP multicast address corresponding to a path selected between the main path and the sub-path, as a destination IP address, and is configured to receive a path diagnosis packet of which destination IP address matches with the IP multicast address corresponding to each of the main path and the sub-path,

wherein a router for performing a path control of the communication path in accordance with Internet Protocol is provided on the communication path, and the communication path includes a plurality of sub-networks being interconnected by the router,

wherein a sole master station exists on the sub-network,

wherein the master station is configured to transmit an inter-network diagnosing frame including path state information on the paths between the home station and all another communication stations existing on the sub-network to which the home station belongs and path state information on the path between the home station and a master station existing on a sub-network to which the home station does not belong, and

wherein each of all communication stations on the plurality of sub-networks including the master station and the other communication stations includes:

a path state storing section configured to store path state information indicating whether the communication path from the home station to each of another communication stations is sound;

a diagnosing message receiving section configured to register in the path state storing section the path state between the home station and the communication station existing on the

sub-network to which the home station does not belong, based on the path state information included in the inter-network diagnosing frame; and

a data transmitting section configured to select either the main path or the sub-path in accordance with the information in the path state storing section, and performs transmission of data.

35. (New): A communication control system for controlling communications performed between a plurality of communication stations that are connected to communication paths being duplicated with a main path and a sub-path, the communication control system comprising:

first communication function implementing sections which are duplicated so as to correspond with the main path and the sub-path respectively, and each of which is configured to implement a communication function in a physical layer of an OSI hierarchical model;

second communication function implementing sections which are duplicated so as to correspond with the duplicated first communication function implementing sections respectively, and each of which is configured to implement a communication function in a data link layer of the OSI hierarchical model;

a high-priority communication section configured to perform a high-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to any one of the duplicated communication paths, the high-priority communication section being configured to transfer first data in accordance with a protocol dedicated to process control; and

a low-priority communication section configured to perform a low-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to the sub-path, the low-priority communication section being configured to transfer second data in accordance with an open standard protocol, wherein the first data is more real time than the second data,

wherein the high-priority communication section and the low-priority communication section coexist in a single communication station,

wherein the high-priority communication section is configured to perform the high-priority communication via the main path in a normal state,

wherein the high-priority communication section is configured to perform the high-priority communication via the sub-path in abnormal state while the low-priority communication is restricted, and

wherein the second communication function implementing section includes:

an address storing section configured to store MAC addresses corresponding to the high-priority communication section and the low-priority communication section respectively;

a transmitting section configured to attach the corresponding MAC address to a communication frame depending on whether a transmission requestor is the high-priority communication section or the low-priority communication section, and configured to transmits the communication frame to the communication path; and

a receiving section configured to compare a destination MAC address of the communication frame received from the first communication function implementing section with

the MAC address stored in the address storing section, and when a match is found in the comparison result, configured to send the received communication frame to the corresponding communication section.

36. (New): A communication control method for controlling communications performed between a plurality of communication stations that are connected to communication paths being duplicated with a main path and a sub-path, the communication control method comprising the steps of:

implementing a communication function in a physical layer of an OSI hierarchical model using first communication function implementing sections which are duplicated so as to correspond with the main path and the sub-path respectively;

implementing a communication function in a data link layer of the OSI hierarchical model using second communication function implementing sections which are duplicated so as to correspond with the duplicated first communication function implementing sections respectively;

performing a high-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to any one of the duplicated communication paths, the high-priority communication including transferring first data in accordance with a protocol dedicated to process control; and

performing a low-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to the sub-path, the low-priority communication including transferring second data in accordance with an open standard protocol, wherein the first data is more real time than the second data,

wherein the high-priority communication and the low-priority communication occur in a single communication station,

wherein the high-priority communication occurs via the main path in a normal state,

wherein the high-priority communication occurs via the sub-path in abnormal state while the low-priority communication is restricted, and

wherein said implementing the communication function in the data link layer of the OSI hierarchical model includes:

storing MAC addresses corresponding to the high-priority communication and the low-priority communication respectively;

attaching the corresponding MAC address to a communication frame depending on whether a transmission requestor is for the high-priority communication or for the low-priority communication;

transmitting the communication frame to the communication path; and

comparing a destination MAC address of the communication frame received from the first communication function implementing section with the MAC address stored by said storing,

and when a match is found in the comparison result, using the received communication frame for the corresponding high-priority or low-priority communication.